

## NANOTUBE-AMINO ACIDS AND METHODS FOR PREPARING SAME

[0001] This invention was made with support from the ~~Robert A. Welch Foundation, Grant No. C-0109; and the Texas Higher Education Coordinating Board's Advanced Technology Program, Grant No. 003604-0026-2001~~ National Aeronautics and Space Administration Langley Grant No. NCC1-02038.

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0002] This Application claims priority to United States Provisional Application Serial No. 60/537,982, filed January, 21, 2004.

### FIELD OF THE INVENTION

[0003] This invention relates generally to carbon nanotubes, and specifically to amino acids into which carbon nanotubes are integrated.

### BACKGROUND OF THE INVENTION

[0004] There is currently great interest in the potential use of carbon nanoscale materials for medical and biological applications. This interest is at least partially fueled by the spherical or cylindrical surface morphology of many of these materials, particularly those having cage-like nanostructures that are stable with respect to cage opening under *in vivo* environmental conditions. However, in order to become biocompatible such carbon nanomaterials need to be surface-functionalized with organic groups that can facilitate both improved solubility in physiological solutions and selective binding affinity to bio-targets. Therefore, developing simple and cost-effective chemical methods for covalent functionalization of carbon nanocage materials has become an area of immense fundamental and industrial importance. This research holds great promise for bio-medical applications—as was recently demonstrated by the ability of modified carbon nanotubes to cross the cell membrane and enter the nuclei of cells, and their being non-toxic to the cell at concentrations up to 10  $\mu$ M [Pantarotto *et al.*, *J. Am. Chem. Soc.* **2003**, 125, 6160; Pantarotto *et al.*, *Chem.*